

Math 115

Spring 2017

Lecture 4

Solution is a numerical value that makes the equation a true statement.

ex: -2 is a solution for

$$4x + 3 = -5.$$

Verify: $4(-2) + 3 = -5$

$$-8 + 3 = -5$$

$$-5 = -5$$

True Statement

ex: Is 7 a solution for

$$x^2 - 5x = 10?$$

$$(7)^2 - 5(7) = 10$$

$$49 - 35 = 10$$

$$14 = 10$$

False Statement

7 is Not a Solution.

Linear Equations: $Ax + B = C$

ex: Solve

$$-2x + 7 = 35$$

$$-2x = 35 - 7$$

$$-2x = 28$$

$$\frac{-2}{-2}x = \frac{28}{-2}$$

$$x = -14$$

$x = \dots$ is the Solution

Solution Set $\{ \}$

Soln Set $\{-14\}$

Check: $-2(-14) + 7 = 35$

$$28 + 7 = 35$$

$$35 = 35 \checkmark$$

Solve:

① $3(x-7) + 1 = x + 20$

$$3x - 21 + 1 = x + 20$$

$$3x - 20 = x + 20$$

$$3x - x = 20 + 20$$

$$2x = 40$$

$$x = 20$$

$\{20\}$

② $\frac{3}{4}x - \frac{2}{5} = \frac{1}{2}x + \frac{1}{4}$

$$\text{LCD} = 20$$

$$4 = 2 \cdot 2$$

$$5 = 5$$

$$2 = 2$$

$$\text{LCD} = 2 \cdot 2 \cdot 5 = 20$$

$$20 \cdot \frac{3}{4}x - 20 \cdot \frac{2}{5} = 20 \cdot \frac{1}{2}x + 20 \cdot \frac{1}{4}$$

$$15x - 8 = 10x + 5$$

$$15x - 10x = 5 + 8$$

$$5x = 13$$

$$x = \frac{13}{5}$$

$$x = 2.6$$

$\{2.6\}$

7 more than 3 times the sum of some number and 5 is equal to -12 less than the number. Find the number.

Let x be the number,

$$3(x + 5) + 7 = x - (-12)$$

$$3x + 15 + 7 = x + 12$$

$$3x + 22 = x + 12$$

$$3x - x = 12 - 22$$

$$2x = -10$$

$$x = -5$$

the number is -5.

Reverse
more than
less than
Added to
Subtract from

Solve $2.8x - 1.35 = 3.65 - 2.2x$

Method I: Keeping the decimals

$$2.8x + 2.2x = 3.65 + 1.35$$

$$5x = 5 \Rightarrow x = \frac{5}{5} \quad \boxed{x=1} \rightarrow \{1\}$$

Method II: Removing the decimals

Multiply by $10^2 = 100$

$$100 \cdot (2.8x) - 100(1.35) = 100(3.65) - 100(2.2x)$$

$$280x - 135 = 365 - 220x$$

$$280x + 220x = 365 + 135$$

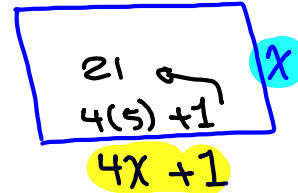
$$500x = 500$$

$$\boxed{x=1}$$

$\{1\}$

The length of a rectangle is 1 cm longer than four times its width.

1) Draw & label such rectangle



2) Find its dimensions if its perimeter is 52 cm.

5 cm by 21 cm.

$$P = 52$$

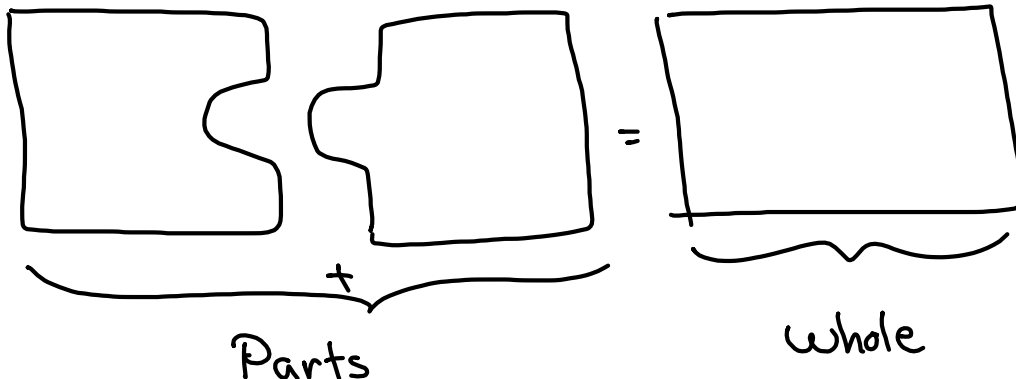
$$2L + 2W = 52$$

$$2(4x+1) + 2(x) = 52$$

$$8x + 2 + 2x = 52$$

$$10x = 50$$

$$x = 5$$

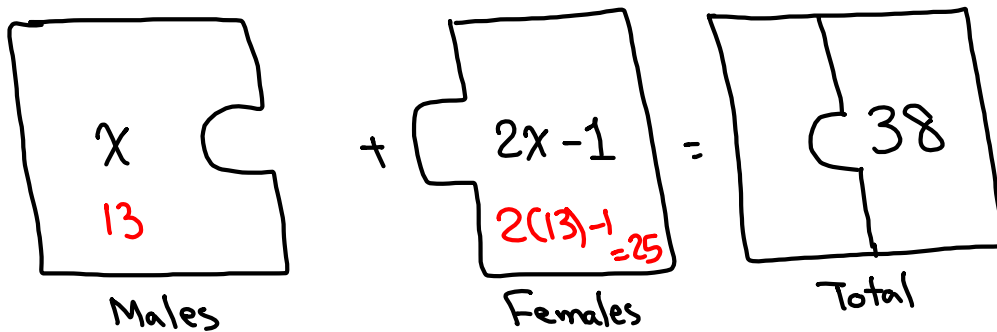


There were 38 Students in a classroom.

The number of Females was 1 fewer than twice the number of males. How many of each?

Males $\rightarrow x$

Females $\rightarrow 2x - 1$



$$x + 2x - 1 = 38$$

$$3x - 1 = 38 \Rightarrow 3x = 39 \Rightarrow x = 13$$

13 Males & 25 Females

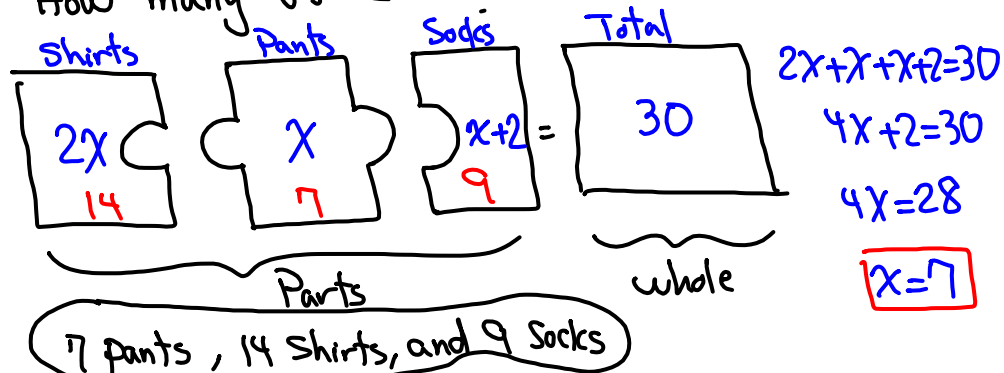
Jose went to Costco and bought 30 items.

Shirts, Pants, and Socks only.

The number of shirts was twice the # of pants.

The number of Socks was 2 more than the # of Pants.

How many of each?

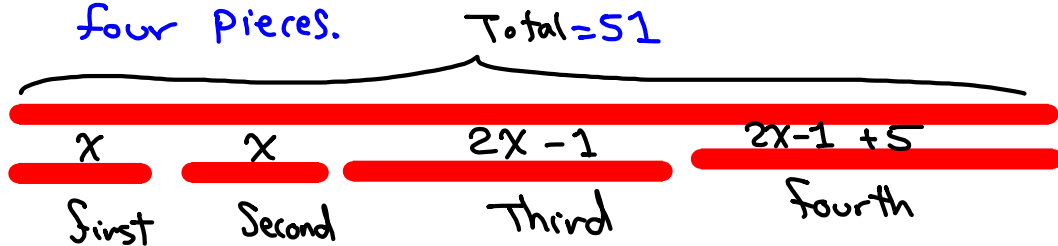


Maria cut a piece of wood in 4 pieces.

Two pieces had same length. Total length of wood was 51 inches

The third piece was 1 inch shorter than the sum of equal pieces.

The last piece was 5 inches longer than the third piece. Find the measure of all four pieces.



$$\text{First} + \text{Second} + \text{Third} + \text{Fourth} = 51$$

$$\boxed{x} + \boxed{x} + \boxed{2x - 1} + \boxed{2x - 1 + 5} = 51$$

$$6x + 3 = 51$$

$$6x = 51 - 3$$

$$6x = 48$$

$$\boxed{x = 8}$$

8 inches, 8 inches,
15 inches, and
20 inches.

when linear equation has exactly one Solution	The equation is Conditional
infinitely many Solutions	is an identity
No Solution	is a Contradiction

Solve & determine the type:

$$2(x - 5) - 4(x + 1) = 24$$

$$2x - 10 - 4x - 4 = 24$$

$$-2x - 14 = 24$$

$$-2x = 38$$

$$\boxed{x = -19} \rightarrow \{-19\}$$

Exactly one Soln
 \Rightarrow Conditional Equation

$$3(2x + 4) - 10 = 2(3x - 1) + 5$$

$$6x + 12 - 10 = 6x - 2 + 5$$

$$6x + 2 = 6x + 3$$

$$6x - 6x = 3 - 2$$

$0 = 1$
 False Statement
 NO Soln $\rightarrow \emptyset$
 Eqn is a Contradiction

$$4(3 - 2x) - 7x = 3(-2x + 5) - 9x - 3$$

$$12 - 8x - 7x = -6x + 15 - 9x - 3$$

$$\boxed{12} - 15x = \boxed{-15x} + 12$$

$$-15x + 15x = 12 - 12$$

$$0 = 0$$

True Statement

infinitely many

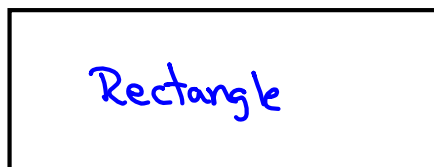
Solns, All Reals,

\mathbb{R}

Eqn is an identity

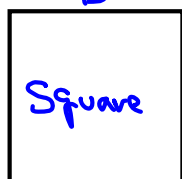
Due Monday SG3 & wp4

Formula is an equation with more than one variable.



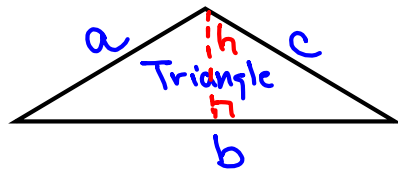
$$P = 2L + 2W$$

$$A = LW$$



$$P = 4S$$

$$A = S^2$$



$$P = a + b + c$$

$$A = \frac{bh}{2}$$

Solve $P = \boxed{a} + b + c$ for a .
isolate

$$\boxed{P - b - c = a}$$

Solve for L : $P = 2\boxed{L} + 2W$

$$P - 2W = 2L$$

$$\boxed{\frac{P - 2W}{2} = L}$$

Solve for b : $A = \frac{\boxed{b}h}{2}$

Multiply by LCD to remove fraction, LCD = 2

$$2A = \cancel{2} \cdot \frac{bh}{\cancel{2}}$$

$$2A = \boxed{b}h$$

$$\frac{2A}{h} = \frac{\cancel{b}h}{\cancel{h}}$$

$$\boxed{b = \frac{2A}{h}}$$

Solve $2x + 3y = 10$ for y .

$$3y = 10 - 2x$$

$$y = \frac{10 - 2x}{3}$$

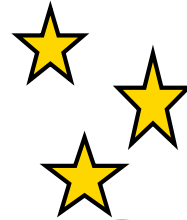
$5x - 2y = 8 \rightarrow$ Solve for y .

$$-2y = -5x + 8$$

$$y = \frac{-5}{-2}x + \frac{8}{-2}$$

$$y = \frac{5}{2}x - 4$$

Recall $\rightarrow y = mx + b$
Slope-Int form

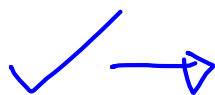


Solve for y : $4x + 3y = 9$

$$3y = -4x + 9$$

$$y = \frac{-4x + 9}{3}$$

$$= \frac{-4x}{3} + \frac{9}{3}$$



$$y = -\frac{4}{3}x + 3$$

if you do
 ~~$y = \frac{-4x + 9}{3}$~~
 You are wrong:

Solving Simple Proportion equation:

Solve

$$\frac{x}{4} = \frac{7}{5}$$

$$5x = 4 \cdot 7$$

$$5x = 28$$

$$\boxed{x = \frac{28}{5}}$$

$$\Rightarrow \left\{ \frac{28}{5} \right\}$$

$$\frac{A}{B} = \frac{C}{D}$$

To Solve, we do

Cross-Multiplication

Solve

$$\frac{x-3}{x+5} = \frac{1}{2}$$

$$\Rightarrow 2(x-3) = 1(x+5)$$

$$2x - 6 = x + 5 \rightarrow \text{Conditional}$$

$$2x - x = 5 + 6$$

$$\boxed{x = 11} \rightarrow \{11\}$$

$$\frac{3x-15}{3} = \frac{2x-10}{2}$$

$$2(3x-15) = 3(2x-10)$$

$$6x - 30 = 6x - 30$$

$$\vdots$$

$$0 = 0$$

infinitely many Solns
Identity

Solve $\frac{3x-1}{4x+5} = \frac{3}{4}$

$$4(3x-1) = 3(4x+5)$$

$$12x - 4 = 12x + 15$$

$$12x - 12x = 15 + 4$$

$$0 = 19$$

Equation is Contradiction

→ false

∴ therefore

NO Solution \emptyset

$\{ \}$

Do not do this $\{ \emptyset \}$

Exam 1: Next Thursday

Solve for y : $\frac{2}{3}x - \frac{1}{4}y = \frac{5}{6}$ Hint: Use LCD

to clear
fractions

LCD = 12

$$\cancel{12} \cdot \frac{2}{3}x - \cancel{12} \cdot \frac{1}{4}y = \cancel{12} \cdot \frac{5}{6}$$

$$8x - 3y = 10$$

$$y = \frac{-8x + 10}{-3}$$

$$-3y = -8x + 10$$

$$y = \frac{10 - 8x}{-3}$$

$$y = \frac{-8}{-3}x + \frac{10}{-3}$$

$$\boxed{y = \frac{8}{3}x - \frac{10}{3}} \quad y = mx + b$$

$$y = -\frac{10 - 8x}{3}$$